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ABSTRACT

While teachers are well aware of the effect of nutrition on children's health, they are less aware of the relationship of diet to the learning process. An indirect relationship between nutrition and learning exists because food is required to supply energy for learning. Research has shown that a highly nutritional breakfast results in improved student attention in late morning task performance. Poor nutrition reduces the body's capacity to resist disease and infection, and iron-deficient blood is inefficient in transporting oxygen to the cells of the body and brain. A direct relationship between diet and learning has been shown by research indicating that protein-poor diets produce children who are less able to learn, have lower intelligence quotients, and poorer language development. The magnitude of the effects of nutritional deprivation appears to be positively correlated with its duration and severity and the developmental period during which it occurs. Reading teachers should become activists in the field of nutrition education. Among the points of a positive course of action for reading teachers are the following: (1) reading teachers and all educators should develop and enforce nutrition education programs; (2) teachers should stimulate children's awareness of and interest in good nutrition; (3) teachers should work with parents and school authorities to replace candy, sweets, and colas in vending machines with fruits, nuts, milk, and fruit juices; and (4) teachers should be alert to typical food allergy reactions, and bring them to parents' attention, encouraging consultation with their physicians. (HTH)

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What is the Relationship Between Nutrition and Learning?

by

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WHAT IS THE RELATIONSHIP BETWEEN NUTRITION AND LEARNING?

Teachers are well aware of the effect of diet and nutrition on the general health of children. However, we are less aware of the relationship of diet to the learning process. Teachers may even question this relationship. Is there any basic information on which teachers can rely? To answer this question, the authors present a selective summary of research done in the area of nutrition and learning, and list some practical suggestions for teachers to follow.

There are two general areas showing a link between nutrition and learning. The first of these is an indirect relationship and the second is direct. An indirect relationship is one in which the diet affects the body's ability to use its innate capacity to learn. A direct relationship is one in which the development of the central nervous system is affected by diet.

Direct and Indirect Relationships

Indirect Relationships

Indirect, but causally linked, is the food required to supply energy for learning. This is the nutrition-energy-learning chain. The child who is underfed lacks the fuel to supply the power generator. Reading teachers are familiar with the child whose attention span lags as the day progresses. Morrell and Atkinson (1977) found that a breakfast of high nutritional content resulted in improved student attention in late morning task performance. In early life, caloric deficits lead to reduction of activity which, in turn, results in less play with peers, less verbalizing and sensory stimulation (Latham and Cobos, 1971; Birch, 1972). Because of this, children enter school with minimal readiness for learning. A low level of sensory stimulation in pre-school years and poor attention in the school age child are associated with later manifestations of intellectual deficit.

A second indirect link to learning is the effect of poor nutrition on absenteeism. Poor nutrition reduces the body's capacity to resist disease and infection, and a sick child has a poor school attendance record. It was found that malnourished children in Mexico had twice as many sick days as normal children (Martinez and Chevez, 1979). The absent child is deprived of continuity of instruction and may miss essential elements. The reading teacher well knows the frustration of reteaching lost skills to children whose attendance is sporadic.

A third indirect link is the effect of an iron deficient diet and consequent anemia on learning. Iron-deficient blood is inefficient in transportation of oxygen to the cells of the body. About half of the oxygen used in energy consumption by the child is used by the brain cells (Lund, 1959; Williams, 1956). In a study by Eames, more than one-third of his subjects showed a low hemoglobin level. He inferred that iron deficiency anemia may be a contributing cause to reading disability (Eames, 1953).

Should not reading teachers in low socio-economic areas consider the effect of an iron deficient diet on their low achievers?

Food allergies

In addition to these general principles, there are idiosyncratic responses to certain foods--food allergies. Physical discomforts from hives, rashes, or asthma can cause reduced attention to the learning task. Although there is agreement with this general principle, there is great controversy regarding specific dietary items which cause learning problems. Some nutritionists propose that a broad spectrum of children with learning problems are affected by specific items in the diet; others relate the problems to individual body reactions (Crook, 1980).

Some examples of foods and food products claimed to have a wide spread effect on children and their learning are: food additives, artificial food colorings, and sugar. The ingestion of these has been blamed for the hyperactivity which may impede learning. Feingold (1979) proposes specific diets to control hyperactivity, i.e. elimination of synthetic colors and flavors. BHT, BHA, (preservatives), and foods containing salicylates. Other researchers found the Feingold diet not to have made significant differences in their experiments (Chernick, 1980; Conners, 1976). Research by Stoch and Smythe (1976) showed that ingestion of refined sugar had a negative effect on behavior and learning of children. Another study by Palmer (Gitteau, 1978) reported a high correlation between caffeine-sugar intake in children and learning problems.

Variance in metabolism

It is recognized that some learning problems may be related to diet, but arise neither from improper nor inadequate diet. They may be caused by individual variances in metabolism which cause difficulty in utilizing available nutrients (Williams, 1956). Alterations of diet alone may not correct such deficiencies. The amelioration of metabolic problems is in the

realm of medicine and is best determined by pediatric examination. Reading teachers should help parents to be aware of the need for comprehensive medical examinations.

Direct Relationships

A direct relationship between diet, intellect and learning has been shown by research, most of which has been done in foreign countries with masses of deprived people. Results indicate that protein-poor diets produce children who are less able to learn, have lower intelligence quotients, and poorer language development than those not so deprived. Selected examples illustrate these findings.

Protein deficiency

Freeman, et. al. (1977) did a longitudinal controlled study in Guatemala with over a thousand 3 and 4 year old children. He found that the addition of protein enriched supplement to the diet resulted in a significant difference in the cognitive composit score (memory, recognition, perception, inference, and verbalization). When a social index factor was applied, he found it was of greater significance in the language measures, but of lesser significance than nutrition in the other measures. The relationship of the cognitive functions in Freeman's study to beginning reading, is well recognized by reading teachers. However the relationship between diet and these functions should be recognized as well.

Pereira, et. al. (1979) studied 79 children aged 6 - 12 in India who had survived kwashiorkor (protein-energy malnutrition or PEM) in early childhood. They were compared with 102 normal children. The PEM children performed significantly less well on the Seguin form board and in matching tasks. General school performance was also inferior, and a two-year follow-up study showed no relative improvement with age.

General malnutrition

Christiansen (1977), controlled for social variables in his survey of

over 200 Colombian infants and preschoolers, all of whom were undersized and under weight. He found a high correlation between height/weight and mental ability in all the children, and between height/weight and vocabulary in the preschool children. Rodriguez, et. al. (1979) found that language and speech development of malnourished children in Mexico was severly affected with children below age 5. Similar results were reported at a Swedish symposium on nutrition (Cravioto and DeLicardie, 1974). Reading teachers recognize the importance of vocabulary, language and speech development in the process of learning to read.

Research has shown that general malnutrition is also highly correlated with poor intellectual development and school achievement. Stoch and Smythe (1967) found that at school age, malnourished children had IQ's averaging 22.6 points lower than normal children. Booyens, et. al. (1977) found that even one year of formal instruction failed to raise the reading age quotient of undernourished South African children. In Brazil, Turini, et. al. (1978) reported that 157 undernourished children had significantly poorer academic achievement than their normal counterparts.

Of special interest to reading teachers are the findings of Cravioto, et. al.(1966) in which malnourished children evidenced deficiencies in audio-visual integration, a process associated with beginning reading. Visual acuity, also closely related to reading ability, can be affected by diet (Damodaran, et. al., 1979). There is a significant correlation between Vitamin B-complex deficiency and defective vision. This condition was shown to be reversible with B-complex supplements.

Effect of early and prolonged deprivation

The magnitude of the effects of nutritional deprivation appears to be positively correlated with its duration and its severity. It is also linked to the developmental period during which it occurs. In a study of 20 Mexican children who had recovered from kwashiorkor (PEM), the age at

which the children were affected determined the prognosis for subsequent intellectual growth. Those who became ill prior to 6 months of age improved relatively little over time (Cravioto, et. al. 1965). This confirmed an earlier finding in Uganda (Geber and Dean, 1956).

In a Colombian longitudinal study of 370 children, a treatment of health, nutrition, educational activities and protein supplement was instituted to ameliorate intellectual deficits. The researchers found that the treatment helped to reduce the intellectual deficits, but was less effective with increasing age (McKay, et. al., 1978).

Since the child's brain begins to develop before birth, the nutrition of the mother is of paramount importance at that time. Starvation in utero, or in the very early months of post-natal development, is most devastating to the developing child (Lewin, 1975). The mother's adequate food supply during pregnancy was found to be even more important than food supplements given later to children (Freeman, et. al., 1977). Thus the research clearly shows that nutritional deprivation negatively affects cognitive development.

Despite the fact that the studies were done in countries with severely deprived populations, we should not ignore their relevance to more affluent countries. Here, the severly deprived exist in small pockets of poverty. However, deprivation through improper diet occurs across all socio-economic levels. Such deprivation in affluent countries is less frequently recognized but no less damaging to children.

The relationship of diet to the learning process is clear. Having knowledge of that relationship, reading teachers should become activists in the field of nutrition education.

A Positve Course of Action for Reading Teachers

1) In districts where nutrition education is presently a component of the curriculum, reading teachers and all educators should see that this topic receives more than the lip service often given.

2) Where no such curriculum component exists, it should be developed immediately and implemented.

3) Teachers should read and become well informed on nutrition information and thus become a source of information for parents.

4) Teachers should stimulate children's interests in and awareness of good nutrition by developing nutrition units in the school curriculum. These units can occur in social studies, science and mathematics courses as well as in health courses.

5) Teachers should work with parents and school authorities to remove candy, cola and other caffeine beverages from vending machines and school cafeterias. These should be replaced with fruits, nuts, milk and fruit drinks.

6) Teachers should discourage fund raising projects which rely on the sale of candy or sweets. Fund raising can be effective through the sale of nuts, dried fruits, and non-edible items.

7) Teachers should be alert to typical food allergy reactions in children, and bring them to the attention of parents, encouraging consultation with their physicians.

8) Teachers should insist that our schools set the best example by serving and selling only highly nutritious foods.

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